Claims

[c1] 1. A system for creating a combinatorial coating library, comprising:
a coating system operatively coupled to at least one of a plurality of materials suitable for forming at least one coating layer on a surface of one or more substrates; and
a curing system operative to apply at least one of a plurality of curing environments to each of a plurality of regions associated with the at least one coating layer;
wherein the combinatorial coating library comprises a predetermined combination of at least one of the plurality of materials and at least one of the plurality of curing environments associated with each of the plurality of regions.

[c2] 2. The system of claim 1, wherein the curing system is operable to apply substantially the same predetermined one of the plurality of curing environments to each of the plurality of regions associated with the at least one coating layer of the one or more substrates.

[c3] 3. The system of claim 1, wherein the curing system is operable to apply a substantially different predetermined one of the plurality of curing environments to each of the plurality of regions associated with the at least one coating layer of the one or more substrates.

[c4] 4. The system of claim 1, wherein the plurality of materials further comprise a material selected from the group consisting of polymeric materials, oligomeric materials, and small molecules.

[c5] 5. The system of claim 1, wherein the coating system further comprises a coating system selected from the group consisting of a spray/vapor coating system, spin coating system, dip coating system, flow coating system, and draw-down coating system.

[c6] 6. The system of claim 1, wherein the curing system further comprises a heating source in thermal communication with a heating element operably positionable adjacent to the one or more substrates.

[c7] 7. The system of claim 6, wherein the heating element has a variable heat

distribution characteristic along a dimension of the heating element.

[c8] 8. The system of claim 6, wherein the heating element has a constant temperature distribution along a dimension of the heating element.

[c9] 9. The system of claim 6, wherein the heating element has a variable temperature distribution along a dimension of the heating element.

[c10] 10. The system of claim 6, wherein the heating element has a geometrical shape which is a predetermined function along the length of the heating element.

[c11] 11. A system for creating a combinatorial coating library, comprising:
a coating system operatively coupled to at least one of a plurality of materials suitable for forming at least one coating layer on a surface of one or more substrates; and
a curing system operative to apply at least one of a plurality of curing environments to each of a plurality of regions associated with the at least one coating layer, the curing system comprising a heating source in thermal communication with an elongate heating element operably positionable adjacent to the one or more substrates, wherein the heating element has a variable heat distribution characteristic along a dimension of the heating element;
wherein the combinatorial coating library comprises a predetermined combination of at least one of the plurality of materials and at least one of the plurality of curing environments associated with each of the plurality of regions.

[c12] 12. A system according to claim 1, wherein the curing system further comprises a spatial mask having an elongate surface positioned between a curing source and the at least one coating layer, wherein a radiation transmission characteristic varies along a dimension of the elongate surface of the spatial mask.

[c13] 13. A system according to claim 1 wherein one of the plurality of curing environments associated with at least one coating layer further comprises a spatial mask having at least one dimension said mask being positioned between the curing source and the at least one coating layer, wherein the radiation transmission characteristic varies along at least one dimension of the spatial mask.

[c14] 14. A system according to claim 13 wherein the radiation transmission characteristic varies as a function of time and wavelength.

[c15] 15. A system according to claim 13 wherein the radiation transmission characteristic varies exponentially, linearly, sinusoidally, or stepwise.

[c16] 16. A system according to claim 1 wherein the plurality of curing environments include a curing environment selected from the group consisting of thermal radiation, ultraviolet radiation, visible radiation, microwave radiation, electron beam radiation, laser radiation, and humidity.

[c17] 17. A system for creating a combinatorial coating library, comprising:
a coating system operatively coupled to at least one of a plurality of materials suitable for forming at least one coating layer on a surface of one or more substrates; and
a curing system operative to apply at least one of a plurality of curing environments to each of a plurality of regions associated with the at least one coating layer, wherein the plurality of curing environments include a curing environment selected from the group consisting of thermal radiation, ultraviolet radiation, visible radiation, microwave radiation, electron beam radiation, laser radiation, and humidity, the curing system comprising a spatial mask having an elongate surface positioned between a curing source and the at least one coating layer, wherein a radiation transmission characteristic varies along a dimension of the elongate surface of the spatial mask;
wherein the combinatorial coating library comprises a predetermined combination of at least one of the plurality of materials and at least one of the plurality of curing environments associated with each of the plurality of regions.

[c18] 18. The system of claim 1, wherein the coating system further comprises a coating system selected from the group consisting of a spray and vapor coating system, spin coating system, dip coating system, flow coating system, and draw-down coating system.

[c19] 19. A system according to claim 1 wherein said coating system further comprises a dip-coating apparatus having a plurality of substrate holders and a corresponding

plurality of wells, the plurality of substrate holders and the plurality of wells relatively positionable to immerse a plurality of substrates secured by the plurality of substrate holders within at least one of the plurality of materials disposed within the plurality of wells.

[c20] 20. The system of claim 19, further comprising a plurality of substrates each secured by one of the plurality of substrate holders, each of the plurality of substrates comprising an acoustic wave transducer having a first acoustic wave parameter and a second acoustic wave parameter, the first acoustic wave parameter corresponding to a first amount of coating or viscoelastic property of the coating layer, the second acoustic wave parameter corresponding to a second amount of coating or viscoelastic property of the coating layer.

[c21] 21. The system of claim 1, wherein each of the plurality of curing environments comprises one of a plurality of curing sources and one of a plurality of curing characteristics, wherein the curing system is operable to apply substantially the same curing source in combination with a substantially different predetermined one of the plurality of curing characteristics to each region associated with the coating layer.

[c22] 22. The system of claim 1, wherein each of the plurality of curing environments comprises one of a plurality of curing sources and one of a plurality of curing characteristics, wherein the curing system is operable to apply a substantially different curing source in combination with a substantially different predetermined one of the plurality of curing characteristics to each region associated with the coating layer.

[c23] 23. The system of claim 1, wherein one of the plurality of curing environments associated with at least one coating layer further comprises a scanning mirror system having a mirrored surface positionable relative to an incoming radiation beam, wherein the mirrored surface is positionable to direct the incoming radiation beam to a selected one of the plurality of regions associated with the coating layer.

[c24] 24. The system of claim 1, wherein one of the plurality of curing environments associated with at least one coating layer further comprises a plurality of

waveguides each having a first end corresponding to one of the plurality of regions associated with the coating layer and a second end associated with a curing source.

[c25] 25. The system of claim 1, wherein one of the plurality of curing environments associated with at least one coating layer further comprises a heating source in thermal communication with an elongate heating element operably positionable adjacent to the plurality of substrates, wherein the elongate heating element has a modulated heat transmissibility characteristic.

[c26] 26. A system for creating a combinatorial coating library, comprising:
a plurality of substrates each secured by one of a plurality of substrate holders, each of the plurality of substrates comprising an acoustic wave transducer having a first acoustic wave parameter and a second acoustic wave parameter, the first acoustic wave parameter corresponding to a first amount of coating or viscoelastic property of a coating layer on the substrate, the second acoustic wave parameter corresponding to a second amount of coating or viscoelastic property of the coating layer on the substrate;
a coating system operatively coupled to at least one of a plurality of materials for forming a coating layer on a surface of each of the plurality of substrates, the coating system comprising a dip-coating apparatus having a plurality of substrate holders and a corresponding plurality of wells, the plurality of substrate holders and the plurality of wells relatively positionable to immerse the plurality of substrates secured by the plurality of substrate holders within at least one of the plurality of materials disposed within the plurality of wells; and
a curing system operative to apply at least one of a plurality of curing environments to each of a plurality of regions associated with the coating layer;
wherein the combinatorial coating library comprises a predetermined combination of at least one of the plurality of materials and at least one of the plurality of curing environments associated with each of the plurality of regions.

[c27] 27. The system of claim 1, wherein the coating system further comprises
a plurality of substrate holders having a mount for securing each of the plurality of substrates, the plurality of substrate holders each rotatable about a spin axis substantially perpendicular to the surface of each of the plurality of substrates; and

a delivery mechanism operatively coupled to each of the plurality of materials such that at least one of the plurality of materials is deliverable to each of the plurality of substrates.

[c28] 28. The system of claim 27, wherein each of the plurality of substrate holders has a different spin axis.

[c29] 29. The system of claim 27, wherein each of the plurality of substrate holders has the same spin axis.

[c30] 30. The system of claim 1, further comprising a plurality of deposition mechanisms operatively coupled to at least one of the plurality of materials, each of the plurality of deposition mechanisms having a delivery source movable from a first position substantially aligned with the spin axis to a second position substantially positioned away from the spin axis, each delivery source operable in the first position to deliver droplets of the respective material onto the surface of the substrate.

[c31] 31. A system for creating a combinatorial coating library, comprising:
a coating system operatively coupled to at least one of a plurality of materials suitable for forming at least one coating layer on a surface of each of a plurality of substrates, the coating system comprising:
a plurality of substrate holders having a mount for securing each of the plurality of substrates, the plurality of substrate holders each rotatable about a spin axis substantially perpendicular to the surface of each of the plurality of substrates;
a delivery mechanism operatively coupled to each of the plurality of materials such that at least one of the plurality of materials is deliverable to each of the plurality of substrates; and
a curing system operative to apply at least one of a plurality of curing environments to each coating layer associated with each of the plurality of substrates, wherein the plurality of curing environments include a curing source selected from the group consisting of thermal radiation, ultraviolet radiation, visible radiation, microwave radiation, electron beam radiation, laser radiation, and humidity;
wherein the combinatorial coating library comprises a predetermined combination

of at least one of the plurality of materials and at least one of the plurality of curing environments associated with each of the plurality of substrates.

[c32] 32. A system for creating a combinatorial coating library, comprising:
a coating system operatively coupled to at least one of a plurality of materials for forming at least one coating layer on a surface of a substrate; and
a curing system operative to apply at least one of a plurality of curing environments to each of a plurality of regions associated with the coating layer;
wherein the combinatorial coating library comprises a predetermined combination of at least one of the plurality of materials and at least one of the plurality of curing environments associated with each of the plurality of regions.

[c33] 33. The system of claim 35, further comprising:
a plurality of coating applicators forming the coating system, each of the plurality of coating applicators having a supply inlet and a coating head, each supply inlet fluidly coupled to at least one of the plurality of materials, and each coating head defining an elongate distribution channel having a length corresponding to a width of the substrate, each coating head further positioned at a suitable distance adjacent to the surface of the substrate for dispensing a layer of at least one of the plurality of materials onto the substrate;
a plurality of curing stations forming the curing system, each of the plurality of curing stations associated with and positioned adjacent to a corresponding one of the plurality of coating applicators to form a coating and curing zone; and
a holding structure having a securing mechanism operative to hold the substrate and movably position the substrate between and within each of the plurality of coating and curing zones, the holding structure movable within each of the plurality of coating and curing zones from a first position adjacent to a respective one of the plurality of coating applicators to a second position adjacent to a respective one of the plurality of curing stations to operatively form a multi-layer coating defining the coating library.

[c34] 34. The system of claim 36, wherein the at least one coating layer has a variable thickness.

[c35] 35. The system of claim 36, further comprising:

a plurality of delivery mechanisms forming the coating system, each of the plurality of delivery mechanisms coupled to at least one of the plurality of materials, each of the plurality of delivery mechanisms operable to project dispersed droplets of at least one of the plurality of materials onto the surface of the substrate to form the at least one coating layer;

at least a first radiation source positioned adjacent to the coated surface of the substrate and a second radiation source positioned adjacent to an opposing surface of the substrate; and

at least a first and second spatial mask corresponding to the at least first and second radiation sources, wherein the combination of masks and radiation sources defines the curing system, the first and second spatial masks respectively positioned between the respective radiation source and the respective substrate surface, each of the first and second spatial masks having a radiation transmission characteristic that varies along at least one of a length or a width of the respective mask.

[c36] 36. A method for creating a combinatorial coating library, comprising:

selectively applying at least one of a plurality of materials suitable for forming at least one coating layer to a surface of one or more substrates; and

selectively applying at least one of a plurality of curing environments to each of a plurality of regions associated with the at least one coating layer;

wherein the combinatorial coating library comprises a predetermined combination of at least one of the plurality of materials and at least one of the plurality of curing environments associated with each of the plurality of regions.

[c37] 37. The method of claim 39, wherein selectively applying at least one of the plurality of curing environments to each of the plurality of regions further comprises selectively applying substantially the same predetermined one of the plurality of curing environments to each of the plurality of regions associated with the at least one coating layer of the one or more substrates.

[c38] 38. The method of claim 39, wherein selectively applying at least one of the plurality of curing environments to each of the plurality of regions further comprises selectively applying a substantially different predetermined one of the

plurality of curing environments to each of the plurality of regions associated with the at least one coating layer of the one or more substrates.

[c39] 39. The method of claim 39, wherein the plurality of materials further comprise a material selected from the group consisting of polymeric materials, oligomeric materials, and small molecules.

[c40] 40. The method of claim 39, wherein selectively applying at least one of a plurality of curing environments to each of a plurality of regions associated with the at least one coating layer, further comprises using a curing system comprising a heating source in thermal communication with a heating element operably positionable adjacent to the one or more substrates.

[c41] 41. A method of claim 39, wherein selectively applying at least one of a plurality of curing environments to each of a plurality of regions associated with the at least one coating layer, includes using a curing system comprising a heating source in thermal communication with an elongate heating element operably positionable adjacent to the one or more substrates, wherein the elongate heating element has a variable heat distribution characteristic along a dimension of the heating element.

[c42] 42. A method of claim 39, wherein selectively applying at least one of a plurality of curing environments to each of a plurality of regions associated with the at least one coating layer, includes using a spatial mask having an elongate surface, said spatial mask having a radiation transmission characteristic which varies along a dimension of the elongate surface of said spatial mask.

[c43] 43. The method of claim 45, wherein the plurality of curing environments include a curing environment selected from the group consisting of thermal radiation, ultraviolet radiation, visible radiation, microwave radiation, electron beam radiation, laser radiation, and humidity.

[c44] 44. A method for creating a combinatorial coating library, comprising the steps of:
providing a plurality of materials for forming a coating layer on a surface of a substrate;
providing a dip-coating apparatus having a plurality of substrate holders and a

corresponding plurality of wells, the plurality of substrate holders and the plurality of wells relatively positionable to immerse a plurality of substrates secured by the plurality of substrate holders within at least one of the plurality of materials disposed within the plurality of wells; and

providing at least one of a plurality of curing environments to each of a plurality of regions associated with the coating layer;

wherein the combinatorial coating library comprises a predetermined combination of at least one of the plurality of materials and at least one of the plurality of curing environments associated with each of the plurality of regions.

[c45] 45. A method for creating a combinatorial coating library, comprising:

selectively depositing at least one of a plurality of materials onto a surface of each of a plurality of substrates;

rotating each of the plurality of substrates about a spin axis to form a respective plurality of coating layers;

selectively applying at least one curing environment to each of the plurality of coating layers; and

combining selected ones of the plurality of materials and the plurality of curing environments associated with each of the plurality of coating layers for each of the plurality of substrates to form the coating library.

[c46] 46. The method of claim 48, further comprising sequentially depositing the at least one material and applying the at least one curing environment to form a multi-layer coating, wherein the sequence of depositing and applying comprises a coating and curing sequence selected from a plurality of coating and curing sequences.

[c47] 47. The method of claim 49, wherein the depositing of the at least one material further comprises projecting droplets of the at least one material onto the surface of the plurality of substrates through at least one of a plurality of deposition mechanisms.

[c48] 48. A method of creating a combinatorial coating library, comprising the steps of:

selectively depositing at least one coating layer formed from at least one of a plurality of materials onto a surface of a substrate, the surface of the substrate

comprising a plurality of regions; and

selectively applying at least one of a plurality curing environments to each of the plurality of regions;

wherein the selective combination of the at least one of the plurality of materials and the at least one of the plurality of curing environments associated with each of the plurality of regions forms the combinatorial coating library.

[c49] 49. The method of claim 51, further comprising the step of sequentially depositing the at least one coating layer and applying the at least one of the plurality of curing environments to form a multi-layer coating, wherein each sequence of the combination of depositing and applying comprises a coating/curing sequence selected from a plurality of coating/curing sequences.

[c50] 50. The method of claim 52, wherein the depositing of the at least one of the plurality of materials further comprises the step of delivering a substantially continuous liquid flow of the at least one of the plurality of materials to the surface of the substrate through one or more coating applicators, each of the plurality of coating applicators having a supply inlet and a coating head, each supply inlet fluidly coupled to at least one of the plurality of materials, and each coating head defining an elongate distribution channel having a length corresponding to a width of the substrate, each coating head further positioned at a suitable distance adjacent to the surface of the substrate for dispensing a layer of at least one of the plurality of materials onto the substrate.

[c51] 51. The method of claim 52, wherein the depositing of the at least one of the plurality of materials further comprises the step of projecting dispersed droplets of at least one of the plurality of materials onto the surface of the substrate through at least one of a plurality of delivery mechanisms.